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AUTHOR	Abell, Herb; And Others
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ABSTRACT

This document contains the outline of a science curriculum for grades six and seven. General objectives for science education are listed, then a general course overview, a content outline with suggested time allotments, and unit objectives are provided for both the sixth and seventh grade courses. The primary focus of the suggested sixth grade course of study is the development of basic inquiry skills; content covered includes topics from physical science, chemistry, life science, and coastal environment. The seventh grade program is designed to reinforce the basic concepts taught in grade six and to focus on the earth, life, and physical science areas. (DT)

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MOUNT PLEASANT INTERMEDIATE SCHOOL CURRICULUM PROJECT

By

Herb Abell
Ronald Brown
Joseph Pichalcewiz
Mrs. Elizabeth Mooney
Albert Sachs
Mrs. Erma Boyer
William Johnson
Robert Shalvey

Barbara Logan
Del Mod Field Agent

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Foreword

During the school year 1972-1973, three seventh grade science teachers and five sixth grade science teachers of the Mt. Pleasant School District met one day a month to prepare a curriculum suitable for sixth and seventh grades in the Intermediate School. The following is the result of those meetings.

During the three week writing period, schedvled for late June early July, the participants will attempt to complete a teacher's guide based on the objectives here stated. It will contain suggested activities and procedures to reach those objectives as well as specific evaluation items to test student achievement.

Sections of the completed guide will be devoted to information concerning field trips, audio-visual aids, charts, graphs and transparencies, glossary, related activities, and teacher/student references.

MOUNT PLEASANT INTERMEDIATE SCHOOL

PHILOSOPHY OF SCIENCE DEPARTMENT

The intermediate school science philosophy reflects the combined philosophies of Mount Pleasant Intermediate School and of science education.

The intermediate school science program capitalizes upon and attempts to arouse the curiosity and enthusiasm of each student for learning in the science area. It is hoped that the student will begin to ask meaningful questions about his environment as well as strive to become scientifically literate.

Because of rapid changes in scientific knowledge, we feel it is now even more important to acquire and improve upon those basic work-study skills, thinking skills and science processes which enable each student to realize his full potential for learning. In accordance with this, we hope to develop in the student the proper attitudes, interests, and appreciations toward his scientific world. We hope that the student will be able to contribute to society by using his scientific knowledge and processes to solve personal and social problems that arise from his environment. The student must be ready to meet the challenges of a swiftly changing world.

We believe that a laboratory centered approach to the teaching and learning of science will best accomplish the aims of the program because of the characteristics of the pre-adolescent student in the middle school.

The goal of the science program is to offer something for every student - a possible career goal, a worthwhile and enjoyable avocation, or a useful leisure-time activity.

MOUNT PLEASANT INTERMEDIATE SCHOOL

Science

GENERAL OBJECTIVES

These general objectives describe the types of overall learnings that students should acquire through the science program. They serve as a guide to the development and implementation of the total science program at Mount Pleasant Intermediate School.

The study of science aims at having each student:

1. develop, maintain, and use adequately the fundamental scientific processes, work-study skills, and thinking skills which will enable him to solve problems in his environment effectively and to seek explanations of his scientific environment in an organized manner.

2. become competent in the skills of: observation, communication, use and manipulation of scientific equipment, measurement, classification, prediction, inferring, formulation of models, experimentation, and making of operational definitions.

3. increase his scientific vocabulary to the extent that he may become scientifically literate commensurate with the grade level.

4. become competent in the processes for solving his problems and answer his questions in a technological world.

5. become competent in the selection and use of the proper resources to aid him in solving his problems and answering his questions.

6. develop a scientific attitude which causes him to examine problems from all sides, seek additional knowledge about his environment, display a curiosity, spirit of inquiry, and interest for scientific phenomenon in his environment, guard against superstitions, and remain open-minded in his thinking and arguments.

GRADE SIX

OVERVIEW OF COURSE

In light of the statement of philosophy the sixth grade program focuses on acquiring and/or improving basic inquiry skills. The content for the activities is drawn from across the broad categories of the life, earth and physical sciences. It is hoped that these experiences will equip the student with the inquiry skill competency, the manipulative techniques and the intellectual tools which will enable him to do further study in each of these areas.

Since the primary focus is the development of the basic inquiry skills it is to be understood that the processes introduced in the first unit will be used throughout the year. Each of the content units has been developed so as to provide a variety of situations to which these skills may be applied. This is true even in those cases where the objectives do not specifically state all of these skills.

CONTENT OUTLINE

Time Sugg.

Unit I - Process Orientation — 6 weeks

- A. Observing
- B. Classifying
- C. Measuring
- D. Communicating
- E. Experimenting
- F. Inferences
- G. Interpreting Data
- H. Predicting

Unit II - Physical Science — 6 weeks

- A. Sources of Energy
- B. Uses of Energy
- C. Sound
  1. Systems that cause sound
  2. Source of sound
  3. Characteristics of sound
  4. Sound and the human body
  5. Sound and musical instruments
- D. Light
  1. Sources of light
  2. Properties of light
  3. How light travels
  4. Refracted and controlled light
  5. Comparison of light and sound waves
- E. Heat
  1. Using thermometers and recording temperatures
  2. The effects of heat and cold on solids, liquid and gases
  3. Heat transfer

Time Sugg.

Unit III - Chemistry — 7 weeks

A. Safety in lab
B. Atoms and molecules
   1. Physical and chemical changes
   2. Solutions and temperature changes
   3. Strengths of solutions
C. Gases
   1. Oxides
   2. Carbon dioxide
   3. Hydrogen
D. Acids and bases
E. Bleaches and dyes
F. Metals
   1. Physical properties
   2. Chemical properties
   3. Chemical activity of metals
   4. Electromotive series

Unit IV - Life Science — 7 weeks

A. Introduction to a simple microscope
   1. Parts
   2. Lighting
   3. Focusing
   4. Cleaning
   5. Care
B. Preparing a slide
C. Cellular structure of plants
   1. Parts of an onion cell
   2. Staining an onion cell
D. Cellular structure of animals
   1. Mouth cells
   2. Blood cells
E. Comparing plant and animal cells
F. Looking for "life"
   1. Pond water observation
   2. Hay infusion culture
G. Microscopic animals
   1. Paramecium
   2. Euglena
   3. Amoeba
H. Looking elsewhere for cells
   1. Fruits and vegetables
   2. Non-living substances
I. Investigating water content
   1. Examining cellular and non-cellular substances
   2. Weighing with a simple balance

Unit V - Coastal Environment — 7 weeks

A. Background
   1. What, where, when and how of Cape Henlopen
   2. Importance of the cape socially, economically and recreationally

B. Topography of the cape
   1. Shore formations of dunes, both still and moving
   2. Salt marshes
   3. Bay and ocean
C. Ecosystems
   1. Plant and animal life
   2. Food chains working from land to sea
D. Economics and Conservation
   1. Food from the sea
   2. Coastal zoning
   3. Off-shore lightering
   4. Supertankers

Unit VI - Independent Study 3 weeks

A. Formulating a hypothesis
B. Designing an experiment
C. Collecting data
D. Recording and communicating data
E. Interpretation of data

UNIT OBJECTIVES

At the end of the school year, each student assigned to the sixth grade, depending upon his mental ability and past experience, should be able to:

Unit I - Process Orientation

Objective : Demonstrate the ability to use the processes of observing, classifying, measuring, communicating, experimenting, making inferences, interpreting data and predicting when working with scientific ideas.

Enabling Objectives

Observation: Demonstrate methods for making indirect observations of length, width and volume.

Give examples of how each of the five senses can be used as instruments with which man can observe and measure.

Classifying: Identify and name observable properties of objects which could be used to classify the object.

Construct a classification system whereby items can be identified on the basis of their observable properties.

Measurement: Identify the characteristics of a measurement system.

Demonstrate skill in the use of measurement tools, e.g., balance, thermometer, graduated cylinder.

Communicating : Describe an object using its attributes so that it can be easily identified in a collection of similar objects.

Demonstrate the ability to properly identify relevant information and construct a data table or graph using that information.

Using a table or graph describe information given.

Use mean, median, range or mode to describe information.

Experimenting: Distinguish between statements that are hypotheses and those that are not.

Construct a working definition of "variable" and "control".

Construct an hypothesis from a set of observations.

Identify the variables held constant, the manipulated variable and the variable in an investigation.

Inference : Distinguish between an observation and/or inference.

Construct inferences from material obtained from tables, graphs or charts.

Interpreting Data : Identify data collected from a test which support or do not support an hypothesis.

Predicting : Based on observations, experiments and interpretations give a specific forecast of future events.

Unit II - Physical Science

Objective : Define various kinds of energy and classify them on the basis of their sources and uses.

Enabling Objectives

Classify sound on the basis of source and characteristics.

Identify the sources and properties of light.

Compare light and sound waves for likenesses and differences.

Measure the effect of heat energy on solids, liquids and gases.

Demonstrate skill in using a thermometer in correct units to an accuracy of ± 0.5 degrees.

Use graphs to communicate data.

Unit III - Chemistry

Objective : Conduct simple activities to demonstrate physical and chemical changes and to describe the basic process involved.

Enabling Objectives

Demonstrate safety procedures in use of lab equipment.

Describe physical and chemical changes observed.

Classify changes as physical or chemical

Construct a definition for terms, e.g., element, solute, solvent, solution, mixture, compound.

Demonstrate how temperature effects the concentration of a solution.

Identify gases involved in chemical change.

Classify materials as acid or base from the results of a litmus paper test.

Demonstrate separation of metals from compounds.

Unit IV - Life Science

Objective : Describe and identify plant and animal microorganisms found in a sample of pond water or hay infusion culture.

Enabling Objectives

Demonstrate the use of a simple microscope in the observation of plant and animal cells.

Identify the characteristics of a measurement system.

Demonstrate skill in development of units of measurement and standards of measurement.

Construct a classification system whereby items can be identified on the basis of their observable properties.

Identify slide material as plant or animal specimen.

Name pond water or hay infusion organisms when seen through the microscope.

Conduct a test to determine the water content of cellular and non-cellular substances.

Construct an hypothesis from a set of observations.

Identify variables held constant, the manipulated variable and the responding variable in an investigation.

Identify data collected from a test conducted by himself which support or do not support his hypothesis.

Unit V - Coastal Environment

Objective : Describe the probable conditions of a coastal area before and after the introduction of a factor that would upset the ecology.

Enabling Objectives

Identify communities, locate physical features and compute distances after selecting the proper map to use.

Identify and classify plants and animals unique to shore environment.

Forecast tides and predict the effect of tides on marine ecosystems.

Demonstrate the ability to use a microscope in examining plant, animal and mineral specimens.

Demonstrate the ability to measure lengths using the metric system, temperature using a thermometer, and weight using a balance.

Contrast various environments on the basis of land features, environmental conditions, kinds of life found in each, e.g., dune vs pine forest, bay vs ocean waters.

Construct a food web or chain.

Describe the use of the Delaware Bay.

Identify man-made dangers to our shore ecology.

Demonstrate the ability to debate the pros and cons of supertankers, superports, offshore lightering.

Unit VI - Independent Study

Objective : Through an individual project demonstrate the ability to use the basic processes of science to test an hypothesis.

GRADE SEVEN

OVERVIEW OF COURSE

While reinforcing the basic skills taught in grade six, the seventh grade program focuses on specific concepts of science as they relate to the earth, life and physical science areas. The program will be divided into three twelve-week periods. Students will be involved in the three areas of study on a rotational basis.

CONTENT OUTLINE

	Time Sugg.
LIFE SCIENCE	12 weeks

Unit I - Measurement and equipment Used in Life Science

A. Units, Standards and Systems
B. Measuring and measuring instruments
C. Using measuring instruments
D. Using the microscope
E. Using the Triple Beam Balance
F. Using the Bunsen Burner

Unit II - The Cell - The Basic Unit of Life

Unit III - Interactions in Populations

A. Characteristics of populations
B. Non-living factors
C. Living factors
D. Relationships in a population

Unit IV - Interactions in a Community

A. Community relationships
B. Terrestial and aquatic communities
C. Associations between organisms

Unit V - Vertebrates

A. General characteristics
B. Classes
C. Special adaptations

Unit VI - Comparing Organ Systems in Man and Frog

A. The body framework
B. Digestive system
C. Respiratory system
D. Circulatory system
E. Nervous system

PHYSICAL SCIENCE 12 weeks

Unit I - Water: Its Chemical and Physical Properties

A. The three states of water
   1. Effect of dissolved substances
   2. Fahrenheit and Celcius scales
   3. Effect of Reduced Pressure
   4. The Molecular Theory with reference to Three State of Water
   5. The size of molecules
   6. Diffusion of materials in water

B. Solids in Solution
   1. Why things dissolve and what factors effect the speed of dissolving
   2. The process of distillation
   3. What is meant by saturation, dissolve, solution, solvent, and solute

C. Gases in Solution
   1. What gases are in solution
   2. The effect of temperature, pressure, and stirring, on solutions
   3. Collecting gases from water

D. Water in Crystals
   1. Water of crystallization
   2. Hydration and dehydration

E. Acidic and Basic Chemicals
   1. Litmus paper in testing solutions
   2. Neutralization
   3. Acid-basic reactions
   4. Degree of acidity
   5. The pH factor

F. The Natural Water Cycle
   1. Construct a simple hair hygrometer
   2. Construct a water thermometer
   3. The uses of water in home and industry

Unit II - Oxygen and Oxidation: The Products and Results of Oxidation

A. Producing and testing oxygen and carbon dioxide
B. Kinds and speeds of oxidation
C. How much oxygen in the air
D. Products of oxidation
   1. Molecular structure of the products
E. Fire and flames
   1. Oxygen and the rate of burning
   2. Kinds of flames
   3. Fire extinguishers
F. Energy from oxidation
   1. Kindling temperature
   2. Spontaneous combustion
   3. Measuring heat energy
   4. Comparing flames

Unit III - Atmosphere: Its Chemical and Physical Properties

A. Understanding atmospheric pressure
   1. Pressure on water
   2. Balanced and unbalanced pressure
B. Using Atmospheric Pressure
   1. The siphon and other devices
   2. Uses of air pressure found in home and industry
C. Strength of Atmospheric Pressure
   1. How to measure the strength
D. Changing Air Pressure
   1. Air and vacuum pumps
   2. Compressors
   3. The effect of heating and cooling air
   4. Low pressure and condensation
E. Pressures in Moving Air
   1. Effects of slowing down and speeding up air
   2. Pressures on airplane wings
   3. Studying and plotting air currents
F. Particles of Air
   1. Motions of molecules
   2. Molecules and pressure
   3. Molecules in moving air

EARTH SCIENCE 12 weeks

Unit I - Hypotheses and Theories

A. Proposing hypotheses
B. Testing hypotheses
C. The variables of an experiment
D. Planning an experiment
E. Testing by prediction
F. The problem of proof
G. Testing earth science hypotheses
H. Theories
I. Relating concepts
J. Evaluation

Unit II - Minerals and their Uses

A. Becoming acquainted with minerals
B. Identification test
C. Useful properties of minerals
D. Rock forming minerals
E. Water as a mineral
F. Relating concepts
G. Evaluation

Unit III - Life in the Past

A. Clues to the past
B. How fossils are formed
C. Interpreting fossils
D. Reconstructing ancient animals
E. Relating concepts
F. Evaluation

Unit IV - The Nature of Soils

A. Describing soils
B. Physical changes in soils
C. Chemistry of the soil
D. Soil life
E. Relating concepts
F. Evaluation

Unit V - Rocks and their Changes

A. Sedimentary rocks
B. Igneous rocks
C. Metamorphic rocks
D. Relating concepts
E. Evaluation

UNIT OBJECTIVES

At the end of the school year, each student assigned to the seventh grade, depending upon his mental ability and past experience, should be able to:

LIFE SCIENCE

Objective I: Demonstrate the ability to use scientific measurements and to properly use, handle, and care for scientific equipment.

Enabling Objectives:

1. Prepare and mount a specimen on a slide.
2. Identify parts (a) optical, (b) mechanical and illuminating, of the compound microscope.
3. Examine mounted specimen under low power magnification and high power magnification.
4. Examine and compare plant and animal cells.
5. Identify parts and demonstrate use of the Bunsen burner.
6. Identify parts and demonstrate use of the triple beam balance.
7. Examine and compare plant and animal cells.

Objective II: Name endangered plant and animal species and describe ways in which natural habitats can be maintained and developed so the species may continue natural reproduction and replenishment.

Enabling Objectives:

1. Construct a mini-biosphere and observe the interaction within that biotic community.
2. Identify types of communities.
3. Identify those environmental factors that determine community types.
4. Draw a diagram of a food web and be able to explain various steps of it.
5. Identify the special nutritional relationships existing among plants and animals.
6. Classify these relationships as to whether they are harmful or beneficial.

Objective III:

Compare and describe the life cycle of different vertebrates.

Enabling Objectives:

1. Observe live and/or preserved organisms and describe the special body features that enable them to live within their natural habitat.
2. Identify the various organs and systems of a preserved frog.
3. Compare organs and systems of the frog to their human analogues.

PHYSICAL SCIENCE

Objective I: Distinguish between the chemical and physical properties of water.

Enabling Objectives:

1. Describe the molecular theory in reference to the three states of water.
2. Demonstrate skill in using a thermometer by recording temperatures in correct units of +0.5 degrees.
3. Distinguish between the terms solute, solution and solvent.
4. Demonstrate the effect increased temperature has on the amount of solute in a solution by means of a graph.
5. Name 3 ways you could increase the rate of dissolving a solid in a liquid.
6. Name several gases in solution and what purpose they can serve you or other animals.
7. Describe hydrate and dehydrate with reference to water of crystallization.
8. Distinguish between common household acids and bases using litmus paper.

Objective II: Describe the sources and uses of water.

Enabling Objectives:

1. Describe the water cycle in meteorlogical terms.
2. Identify ways that gravity is a moving force in using water.
3. Construct and calibrate simple hair hygrometer.
4. Order four or more uses of water, concerning you in your home, from most important to least important.

Objective III: Demonstrate the ability to recognize oxygen and the products and results of oxidation.

Enabling Objectives:

1. Describe the limitations of test results when testing for oxygen.
2. Construct a diagram to show a method of testing for oxygen and carbon dioxide.
3. Demonstrate skill in testing for and identifying the products of oxidation, namely carbon dioxide, water vapor and carbon.
4. Demonstrate a method to determine the percentage of oxygen in the air.
5. Construct circle graphs to show the eight most plentiful elements of the earth's crust; the five elements making up the atmosphere, and the four elements making up ocean water.
6. State a rule for the union of oxygen and hydrogen atoms in a completed chemical equation.

7. Describe the speeds of oxidation and the cause.
8. Distinguish between heat and temperature.
9. Demonstrate a method of measuring heat.

Objective IV: Distinguish between the chemical and physical properties of the atmosphere.

Enabling Objectives:

1. Name the matter which makes up the atmosphere.
2. Describe three properties of oxygen and nitrogen.
3. Construct a simple aneroid barometer.
4. Demonstrate several procedures which prove atmospheric pressure exists.
5. Construct an inference to explain the movement of a liquid out of an inverted container when air moves in.
6. Construct a siphon and explain its operation.
7. Describe the difference between force and pressure as related to air.
8. Apply a rule for measuring atmospheric pressure.
9. Demonstrate several ways air pressure may be changed and explain results of the change.
10. Describe the pressures in moving air and how man has used this pressure.
11. Describe the molecular theory in reference to pressure and diffusion of a gas.

EARTH SCIENCE

Objective I: Distinguish between statements that are hypotheses and those that are not.

Enabling Objectives:

1. Describe hypotheses in order to propose formulating hypotheses.
2. Demonstrate a test for hypotheses.
3. Identify and name the independent and dependent variables of an experiment.

Objective II: Construct a classification key to identify a small group of common minerals.

Enabling Objectives:

1. Identify and describe minerals according to their feel.
2. Describe observable properties of a given crystal.
3. Construct a chart and identify minerals by their characteristic properties.
4. Identify and name observable properties of minerals which could be used to classify minerals.

5. Construct a one, two or multi-stage classification of a set of minerals and name the observable characteristics on which the classification is based.
6. Construct two or three different classification schemes for the same set of minerals--each scheme serving a different purpose.

Objective III: Demonstrate physical tests for minerals: hardness, luster, crystal, shape, cleavage, fracture, magnetism and streak.

Enabling Objectives:

1. Classify or group minerals from a given set of minerals according to luster.
2. Identify minerals from a given set of minerals by using a streak and hardness test.
3. Identify and group minerals according to cleavage and fracture.
4. Demonstrate a test for magnetism of minerals.
5. Collect, identify and display a mineral collection.

Objective IV: Distinguish similarities and differences in fossil specimens.

Enabling Objectives:

1. Describe how past animal life is inferred from a fossil.
2. Predict whether a fossil will be formed, given certain conditions.
3. Predict whether a fossil cast could be formed by a plant or animal, given its description.
4. Describe how fossils are formed.
5. Determine the age of a fossil given a graph of C_{14} decay and the amount of C_{14} present in the fossil.
6. Identify and name observable properties of fossils which could be used to classify fossils.
7. Construct a one, two, or multi-stage classification of a set of fossils and name the observable characteristics on which the classification is based.
8. Construct two or three different classification schemes for the same set of fossils, each scheme serving a different purpose.

Objective V: Demonstrate chemical test for carbonates by the use of hydrochloric acid in relationship to minerals.

Enabling Objectives:

1. Describe and demonstrate why the HCl fizzes.
2. Construct predictions from minerals tested by this method.

Objective VI: Distinguish how man is directly and indirectly dependent upon soil.

Enabling Objectives:

1. Describe the composition of a given soil sample.
2. Determine if a given sample of soil contains chemicals.
3. Determine if a given sample of soil contains air.
4. Classify a given sample of soil as silt, sand or clay.
5. State why soil is rich in one area and not rich in another.
6. Predict if sand, silt, clay or humus will hold the most water.
7. Predict the relative rate of water movement through sand, silt or clay.
8. Predict from a description of three different areas the relative amounts of water content in the soil from these areas.
9. Demonstrate a test or procedure for determining physical changes in soils.
10. Describe the types of soil life found in soils.
11. Identify at least three layers in a picture of a soil profile.
12. Describe how water rises in soil.

Objective VII: Construct the rock cycle.

Enabling Objectives:

1. Predict the effect of pressure on sediments.
2. Describe at least three different properties of two given different rocks.
3. Group rocks into three groups according to their hardness.
4. Describe how sandstone is formed.
5. Explain why sedimentary rocks of the same kind may have different colors.
6. Describe how conglomerate is formed.
7. Describe how sandstone, conglomerate and shale are different.
8. Describe how different kinds of sand vary.
9. Describe why sand particles stay together in sandstone.
10. Compare the formation of gypsum with the formation of sandstone.
11. Describe at least two properties of limestone.
12. Devise a key for identification of sedimentary rocks.
13. Predict the type of rock in which oil is found.
14. Describe how igneous and sedimentary rocks are formed.
15. Predict if an igneous rock will have large or small crystals when given the conditions of formation.
16. Describe how a metamorphis rock is formed.